

# farrell: An R Package for Interactive Data Envelopment Analysis.

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## Introduction

The goal of farrell is to provide an interactive interface to Data Envelopment Analysis modeling in R. The farrell package is built upon Benchmarking.

## Installation

You can install the development version of farrell with:

```
remotes::install_github("feddelegrand7/farrell")
```

## Example

You can run:

```
library(farrell)

farrell()
```

or if you're working on RStudio, just click on **Addins** then **farrell**.

## Data Loading:

Hit **Browse...** to upload your data frame in a csv format. All the inputs and outputs must be contained within the uploaded data frame. Further, the data frame needs to contain an identification column in order to identify Decision Making Units distinctively. It can be a numeric or a character column.

# Data Frame Overview

Load a csv file

Browse...

No file selected

Loading Data

Model Tuning

Efficiency Results

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In the following examples, we use the mtcars data frame which has been exported in a csv format with an additional column: **cars name**.

# Data Frame Overview

Load a csv file

Browse...

mtcars.csv

Upload complete

cars name	mpg	cyl	disp	hp	drat	wt	qsec	vs	am	gear	carb
Mazda RX4	21.00	6	160.00	110	3.90	2.62	16.46	0	1	4	4
Mazda RX4 Wag	21.00	6	160.00	110	3.90	2.88	17.02	0	1	4	4
Datsun 710	22.80	4	108.00	93	3.85	2.32	18.61	1	1	4	1
Hornet 4 Drive	21.40	6	258.00	110	3.08	3.21	19.44	1	0	3	1
Hornet Sportabout	18.70	8	360.00	175	3.15	3.44	17.02	0	0	3	2
Valliant	18.10	6	225.00	105	2.76	3.46	20.22	1	0	3	1

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## Model Tuning

### Model Tuning

Select the Input Variables

☐ mpg  
☐ cyl  
☐ disp  
☐ hp  
☐ drat  
☐ wt  
☐ qsec  
☐ vs  
☐ am  
☐ gear  
☐ carb

Select the Output Variables

☐ mpg  
☐ cyl  
☐ disp  
☐ hp  
☐ drat  
☐ wt  
☐ qsec  
☐ vs  
☐ am  
☐ gear  
☐ carb

Select the Identification column

cars name

Select the Returns to Scale assumption

crs

Select the orientation

input

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Within the Model Tuning tab, you will select the input and output variables, then you determine your identification column. Then you choose the Returns to Scale assumption between: crs, vrs, irs, drs, add and fdh. After that, you determine the orientation of the model, whether input or output. Finally, hit **Calculate Efficiency** to get the results.

Let's for example consider **mpg** and **disp** as the output variables and **wt** as input. We choose **cars name** as the identification column and model an input-oriented model with crs assumption.

### Model Tuning

Select the Input Variables

☐ mpg  
☐ cyl  
☐ disp  
☐ hp  
☐ drat  
☒ wt  
☐ qsec  
☐ vs  
☐ am  
☐ gear  
☐ carb

Select the Output Variables

☒ mpg  
☐ cyl  
☒ disp  
☐ hp  
☐ drat  
☐ wt  
☐ qsec  
☐ vs  
☐ am  
☐ gear  
☐ carb

Select the Identification column

cars name

Select the Returns to Scale assumption

crs

Select the orientation

input

Calculate Efficiency

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## Efficiency Results

The Efficiency Results tab displays the efficiency scores along with the peers for each unit in a descending order. You have the ability to download the result in a csv format. The tab also provides a summary of the distribution of the efficiency scores.

### Efficiency Results

Click on the download button to get a csv file of the results

download

#### DEA Summary

Summary of efficiencies  
CRS technology and input orientated efficiency  
Number of firms with efficiency==1 are 2 out of 32  
Mean efficiency: 0.739

```
---
Eff range   #    %
0.5<= E <0.6 6 18.8
0.6<= E <0.7 7 21.9
0.7<= E <0.8 7 21.9
0.8<= E <0.9 5 15.6
0.9<= E <1   5 15.6
E ==1       2   6.2
Min. 1st Qu.  Median    Mean 3rd Qu.  Max.
0.5147  0.6206  0.7382  0.7392  0.8235  1.0000
```

Show 10 entries

Search:

	cars name	score	peer1	peer2
1	Lotus Europa	1.0000	Lotus Europa	
2	Ford Pantera L	1.0000	Ford Pantera L	
3	Hornet Sportabout	0.9633	Lotus Europa	Ford Pantera L
4	Pontiac Firebird	0.9473	Lotus Europa	Ford Pantera L
5	Honda Civic	0.9368	Lotus Europa	
6	Toyota Corolla	0.9195	Lotus Europa	
7	Duster 360	0.9107	Ford Pantera L	
8	Dodge Challenger	0.8243	Lotus Europa	Ford Pantera L
9	Camaro Z28	0.8232	Ford Pantera L	
10	Cadillac Fleetwood	0.8120	Ford Pantera L	

Showing 1 to 10 of 32 entries

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## Lambdas

In the Lambdas tab, you get the contribution of the peers to the inefficient units' score.

### Lambdas

Click on the download button to get a csv file of the results

download

Show 10 entries

Search:

	names	Lotus Europa	Ford Pantera L
1	Mazda RX4	0.5283	0.3127
2	Mazda RX4 Wag	0.5283	0.3127
3	Datsun 710	0.6868	0.1216
4	Hornet 4 Drive	0.3747	0.6335
5	Hornet Sportabout	0.0955	0.9998
6	Valliant	0.3052	0.5583
7	Duster 360	0.0000	1.0256
8	Merc 240D	0.6814	0.2333
9	Merc 230	0.6303	0.2304
10	Merc 280	0.4462	0.3566

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## Scale Efficiency

The SE tab provides the Scale Efficiency score of each DMU under consideration.

## Scale Efficiency

Click on the download button to get a csv file of the results

[download](#)

Show 10 entries
Search:

	cars name	CRS	VRS	SE	DRS	Scale
1	Lotus Europa	1.0000	1.0000	1.0000	1.0000	ORS
2	Ford Pantera L	1.0000	1.0000	1.0000	1.0000	ORS
3	Hornet Sportabout	0.9633	0.9957	0.9674	0.9957	DRS
4	Pontiac Firebird	0.9473	1.0000	0.9473	1.0000	DRS
5	Honda Civic	0.9368	0.9368	1.0000	0.9368	ORS
6	Toyota Corolla	0.9195	1.0000	0.9195	1.0000	DRS
7	Duster 360	0.9107	0.9227	0.9870	0.9227	DRS
8	Dodge Challenger	0.8243	0.8399	0.9815	0.8243	IRS
9	Camaro Z28	0.8232	0.8238	0.9992	0.8232	IRS
10	Cadillac Fleetwood	0.8120	1.0000	0.8120	1.0000	DRS

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## Slacks

The Slacks tab displays a data frame containing the sum of the slacks and the slacks for each input/output variables.

## Slacks

Click on the download button to get a csv file of the results

[download](#)

Show 10 entries
Search:

	cars name	sum_slack	wt_slack	mpg_slack	disp_slack
1	Mazda RX4	0.0000	0.0000	0.0000	0.0000
2	Mazda RX4 Wag	0.0000	0.0000	0.0000	0.0000
3	Datsun 710	0.0000	0.0000	0.0000	0.0000
4	Hornet 4 Drive	0.0000	0.0000	0.0000	0.0000
5	Hornet Sportabout	0.0000	0.0000	0.0000	0.0000
6	Valiant	0.0000	0.0000	0.0000	0.0000
7	Duster 360	1.9051	0.0000	1.9051	0.0000
8	Merc 240D	0.0000	0.0000	0.0000	0.0000
9	Merc 230	0.0000	0.0000	0.0000	0.0000
10	Merc 280	0.0000	0.0000	0.0000	0.0000

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## Citation

If you use the farrell package in your publications or teaching activities, please cite as follows:

Mohamed El Fodil Ihaddaden (2020). farrell: Interactive Interface to Data Envelopment Analysis Modeling. R package version 0.1.0. <https://github.com/feddelegrand7/farrell>

A BibTeX entry for LaTeX users is

```
@Manual{, title = {farrell: Interactive Interface to Data Envelopment Analysis Modeling}, author = {Mo-  
hamed El Fodil Ihaddaden}, note = {R package version 0.1.0}, url = {https://github.com/feddelegrand7/  
farrell}, }
```

## **Code of Conduct**

Please note that the farrell project is released with a Contributor Code of Conduct. By contributing to this project, you agree to abide by its terms.